Hand Dynamometer

(Order Code HD-BTA)

The strain-gauge based isometric Hand Dynamometer can be used to measure grip strength, pinch strength, and to perform muscle fatigue studies. Using the appropriate data-collection hardware and software, you can graph, record, calculate, and compare hand grip muscle fatigue rates. This sensor can be used alone or in combination with other sensors (e.g., EKG Sensor) for studies of muscular health and activity.

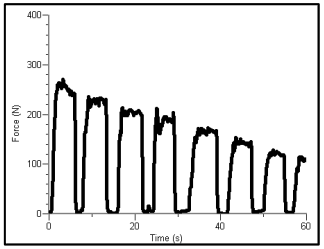
How the Hand Dynamometer Works

This sensor amplifies the force applied converting it into a voltage that is monitored by the lab interface and read in the desired units of force. The Hand Dynamometer reports values in newtons (N), pounds (lb), or kilograms (kg).

Using the Hand Dynamometer

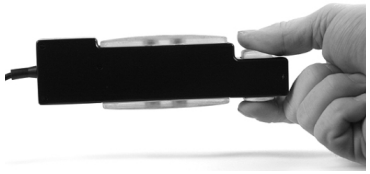
The Hand Dynamometer can be used to measure grip strength or pinch strength.

Grip Strength is performed holding the sensor in a vertical position with arm perpendicular to the body and fingers on the pad distal to the longer proximal portion to which the palm is pressed. Strength can be measured by applying pressure for a series of short grasps or over a sustained duration.



Muscle fatigue

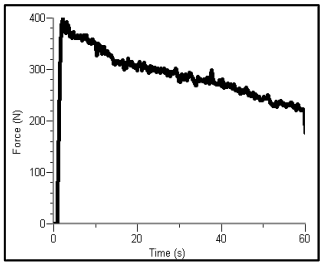
Pinch Strength is assessed by placing the sensor on a flat horizontal surface with the pinch sensor pads in a vertical alignment, extending beyond the table plane. Using your thumb and forefinger, place each on the respective opposing pinch pads and press.



Potential Uses for this Sensor

The following is a partial list of activities and experiment that can be performed using this sensor.

- Is grip and pinch strength a function of age? Do grandparents have the strongest grips and pinches?
- Does hand grip-strength have a correlation with pinch strength? Devise and carry out a study to explore this possibility.



Fatigue over time

- Measure muscle fatigue by exerting maximum grip strength and sustained grasp for as long as you can. Is muscle fatiguing time similar to all participants? Is there variation between age groupings? Does gender exert a role in grip strength? Would repeat trials give the same results for each member of the group? Devise, set up and carry out a study on one of these possibilities?
- Measure the effect on grip strength over time by squeezing a tennis ball as tightly as you can fifty times each evening for a month. At the beginning of the month measure and record your basal grip strength. At the end of the month record your hand grip strength. How do the values compare?
- Is there a correlation between hand size and grip strength? Does wrist circumference exhibit any relationship with grip strength? Does forearm circumference? Anatomically, what muscle complexes would be involved in grip strength and pinch strength?
- Measure Hand Grip-Strength for dominant and non-dominant hands by gripping the Dynamometer in a neutral non-supportive posture with the sensor in your non-dominant hand. Initiate data collection while holding the sensor with neutral grip with eyes closed. What would account for the similarities and differences?

Collecting Data with the Hand Dynamometer

This sensor can be used with the following interfaces to collect data.

- Vernier LabQuest® 2 or original LabQuest® as a standalone device or with a computer
- Vernier LabQuest® Mini with a computer
- Vernier LabPro® with a computer or TI graphing calculator
- Vernier Go!®Link
- Vernier EasyLink®
- Vernier SensorDAQ®
- CBL 2™
- TI-Nspire™ Lab Cradle

Here is the general procedure to follow when using the Hand Dynamometer:

1. Connect the Hand Dynamometer to the interface.
2. Start the data-collection software.
3. The software will identify the Hand Dynamometer and load a default data-collection setup. You are now ready to collect data.

Data-Collection Software

This sensor can be used with an interface and the following data-collection software.

- **Logger *Pro*** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **Logger Lite** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest 2 or LabQuest is used as a stand-alone device.

- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2, LabPro, and Vernier EasyLink. We recommend version 2.0 or newer, which can be downloaded from the Vernier web site, www.vernier.com/easy/easydata.html, and then transferred to the calculator. See the Vernier web site, www.vernier.com/calc/software/index.html for more information on the App and Program Transfer Guidebook.
- **DataMate program** Use DataMate with LabPro or CBL 2 and TI-73, TI-83, TI-84, TI-86, TI-89, and Voyage 200 calculators. See the LabPro and CBL 2 Guidebooks for instructions on transferring DataMate to the calculator.
- **LabVIEW** National Instruments LabVIEW™ software is a graphical programming language sold by National Instruments. It is used with SensorDAQ and can be used with a number of other Vernier interfaces. See www.vernier.com/labview for more information.
- **DataQuest™ Software for TI-Nspire™** This calculator application for the TI-Nspire can be used with the EasyLink or TI-Nspire Lab Cradle.

NOTE: Vernier products are designed for educational use. Our products are not designed nor recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

Calibration

You should not have to perform a new calibration when using the Hand Dynamometer. We have set the sensor to match our stored calibration before shipping it. You can simply use the appropriate calibration value that is stored in the data-collection program.

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, TI-Nspire™ Lab Cradle, EasyLink, or CBL 2™, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

Helpful Tips

- If the sensor does not read zero in the orientation in which you are using it, follow the standard zeroing procedure for the data-collection program you are using.
- If the default experiment length is too long for your experiment, set the data-collection parameters in the program you are using.

Specifications

Stored calibration (N)	slope:	175.416
	intercept:	–19.295
Stored calibration (kg)	slope:	17.8875
	intercept:	–1.9676
Stored calibration (lbs)	slope:	39.4351
	intercept:	–4.3379
Accuracy:		±0.6 N
10 Bit Resolution (using CBL 2):		0.8565N
12 Bit Resolution (using LabQuest 2, LabQuest, LabQuest Mini, LabPro,Go! Link, or TI-Nspire Lab Cradle):		0.2141 N
13 Bit Resolution (using SensorDAQ):		0.1071 N
Power:		7 mA @ 5VDC
Safety range (Maximum Force without damage done to sensor):		0 to 850 N
Operational range:		0 to 600 N

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.

Vernier

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